(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 913 508 A3

(12) EUROPEAN PATENT APPLICATION

(88) Date of publication A3:
12.05.1999 Bulletin 1999/19

(43) Date of publication A2:
06.05.1999 Bulletin 1999/18

(21) Application number: **98308872.5**

(22) Date of filing: **29.10.1998**

(51) Int Cl.[6]: **D01F 9/127**, G01B 7/34

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **30.10.1997 JP 298373/97**
14.09.1998 JP 276426/98

(71) Applicant: **CANON KABUSHIKI KAISHA**
Tokyo (JP)

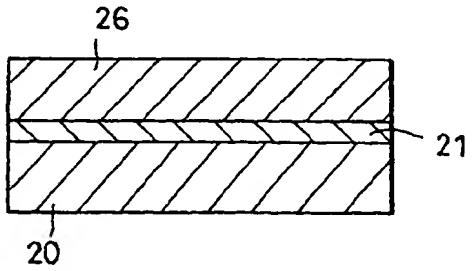
(72) Inventors:
- **Den, Tohru**
  Ohta-ku, Tokyo (JP)
- **Iwasaki, Tatsuya**
  Ohta-ku, Tokyo (JP)

(74) Representative:
Beresford, Keith Denis Lewis et al
BERESFORD & Co.
2-5 Warwick Court
High Holborn
London WC1R 5DJ (GB)

(54) Carbon nanotube device, manufacturing method of carbon nanotube device, and electron emitting device

(57) The present invention discloses a carbon nanotube device comprising a support having a conductive surface and one or more carbon nanotubes, one of whose terminus binds to the conductive surface so that conduction between the surface and the carbon nanotube is maintained, wherein a root of the carbon nanotube where the carbon nanotube binds to the conductive surface is surrounded by a wall. Such a carbon nanotube device, having carbon nanotubes with a uniform direction of growth, can generate a large quantity of emitted electrons when it is used as an electron emission device.

FIG. 8A



EP 0 913 508 A3

FIG. 8B

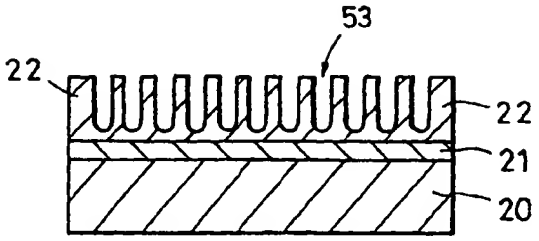


FIG. 8C

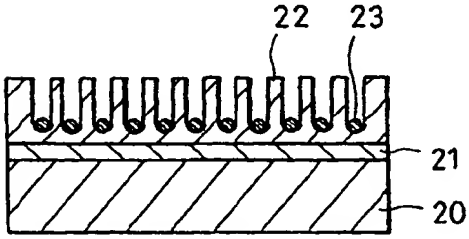
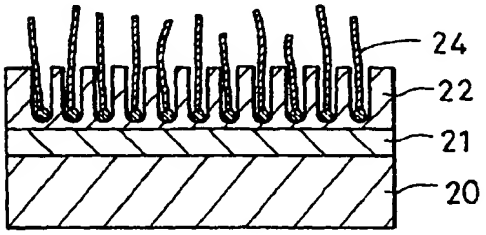


FIG. 8D



European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 98 30 8872

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	T. KYOTANI ET AL.: "Preparation of Ultrafine Carbon Tubes in Nanochannels of an Anodic Aluminum Oxide Film" CHEM. MATER., vol. 8, 1996, pages 2109-2113, XP000626894 * page 2109, right-hand column, line 1 - page 2113, right-hand column, line 34 *	1	D01F9/127 G01B7/34
A	EP 0 758 028 A (RESEARCH DEVELOPMENT CORPORATION OF JAPAN) 12 February 1997 * page 3, line 14 - page 4, line 49; claims; figure 1 *	1	
A	WO 90 07023 A (HYPERION CATALYSIS INT.) 28 June 1990 * page 2, line 14 - page 3, line 19 * * page 4, line 31 - page 8, line 6; claims *	1	
P,A	WO 98 05920 A (WILLIAM MARSH RICE UNIVERSITY) 12 February 1998 * page 8, line 4 - page 9, line 25; figure 1D *	1	

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

D01F
G01B
C01B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	19 February 1999	Hellemans, W

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 98 30 8872

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

19-02-1999

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 758028 A	12-02-1997	JP 9031757 A	04-02-1997
		JP 9228160 A	02-09-1997
		US 5863601 A	26-01-1999
WO 9007023 A	28-06-1990	AU 642401 B	21-10-1993
		AU 4947390 A	10-07-1990
		CA 2005642 A	16-06-1990
		EP 0451208 A	16-10-1991
		IL 92717 A	27-02-1994
		JP 4504445 T	06-08-1992
		KR 137224 B	28-04-1998
		US 5500200 A	19-03-1996
WO 9805920 A	12-02-1998	AU 4055297 A	25-02-1998

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82